

WHAT IS CLAIMED IS:

1. A method of manufacturing a semiconductor device, comprising the steps of:

embedding a copper wiring layer into a plug provided on a semiconductor substrate and a compound of copper into the copper wiring layer from thereabove respectively;

forming a reactive layer and a barrier metal layer interdiffused with the copper wiring layer on the compound of copper; and

interdiffusing the copper compound and the reactive layer by heat treatment to thereby form an alloy layer of copper between the copper wiring layer and the barrier metal layer.

2. The method according to claim 1, wherein the compound of copper is obtained by processing the copper wiring layer according to a method selected out of nitriding, oxidizing, boronizing, sulphidizing or phosphidizing.

3. The method according to claim 1, wherein the reactive layer is at least one kind of material selected from Ti, B, S, Sn, Ga, Ge, Hf, In, Mg, Ni, Nb, Pd, P, Sc, Se, Si, Zn, and Ag.

4. The method according to claim 1, wherein a barrier metal for the barrier metal layer is a material selected from CoSn, CoZ, CoW, Ti, TiN, Ta, TaN, W, and WN.

5. A method of manufacturing a semiconductor device, comprising the steps of:

embedding a copper wiring layer into a plug provided on a semiconductor substrate and a compound of copper into the copper wiring layer from thereabove respectively;

forming a barrier metal layer containing a substance interdiffused with the copper wiring layer on the compound of copper; and

allowing the compound of copper and the barrier metal layer to react by heat treatment to thereby form an alloy layer of copper and a barrier metal layer on the copper wiring layer.

6. The method according to claim 5, wherein the compound of copper is obtained by processing the copper wiring layer according to a method selected out of nitriding, oxidizing, boronizing, sulphidizing or phosphidizing.

7. The method according to claim 5, wherein the substance reacted with the copper is at least one kind of material selected from Ti, B, S, Sn, Ga, Ge, Hf, In, Mg,

Ni, Nb, Pd, P, Sc, Se, Si, Zn, and Ag.

8. The method according to claim 5, wherein a barrier metal for the barrier metal layer is a material selected from CoSn, CoZ, CoW, Ti, TiN, Ta, TaN, W, and WN.